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| APPLICATION NO.                                                                                           | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.          | CONFIRMATION NO. |
|-----------------------------------------------------------------------------------------------------------|-------------|----------------------|------------------------------|------------------|
| 10/709,514                                                                                                | 05/11/2004  | Deok-kee Kim         | FIS920040058<br>(00750488AA) | 3513             |
| 30743                                                                                                     | 7590        | 01/18/2008           | EXAMINER                     |                  |
| WHITHAM, CURTIS & CHRISTOFFERSON & COOK, P.C.<br>11491 SUNSET HILLS ROAD<br>SUITE 340<br>RESTON, VA 20190 |             |                      | PERT, EVAN T                 |                  |
|                                                                                                           |             |                      | ART UNIT                     | PAPER NUMBER     |
|                                                                                                           |             |                      | 2826                         |                  |
|                                                                                                           |             |                      | MAIL DATE                    | DELIVERY MODE    |
|                                                                                                           |             |                      | 01/18/2008                   | PAPER            |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                 |              |  |
|------------------------------|-----------------|--------------|--|
| <b>Office Action Summary</b> | Application No. | Applicant(s) |  |
|                              | 10/709,514      | KIM ET AL.   |  |
|                              | Examiner        | Art Unit     |  |
|                              | Evan Pert       | 2826         |  |

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) 8-14 and 20-23 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 15 and 24 is/are rejected.
- 7) ☒ Claim(s) 2-7 and 16-19 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 August 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                            |                                                                                         |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____                                                |

## DETAILED ACTION

### *Election/Restrictions*

1. Claims 8-14 and 18-23 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction requirement in the reply filed on October 26, 2007.

Applicant argues that the identified species are "patentably distinct," but are "not independent or mutually exclusive species" since the species "are disclosed as being advantageously usable together in paragraph 0032" [page 8 of the reply filed October 26, 2007].

However, paragraph 0032 does not actually state that the species are "usable together," but rather that the third embodiment "provides a material interface effect in much the same manner as a chemical reaction interface or a grain interface enhances the masking of the first and second embodiments" [0032].

Furthermore, the species are mutually exclusive since "the second embodiment" is only "similar to the first embodiment" *except* that "two layers of polysilicon are used *instead* of a layer of TERA" [0029]. The third embodiment is two different material layers forming a so-called "material interface" [0030], so the third embodiment is mutually exclusive from being a single layer of TERA converted to include OH groups or water providing a so-called "chemical interface" [first embodiment] or a double layer of polysilicon providing a so-called "grain interface" [second embodiment].

Each of the three embodiments stand on their own and are usable separately (or together) wherein the first embodiment is not two layers of polysilicon [i.e. second embodiment], which is not two different layers [i.e. third embodiment].

Analogously, two independent and distinct species of a generic hoist could be an electric hoist and a mechanical hoist [two species]; while arguably usable together, the electric hoist and mechanical hoist are properly independent and mutually exclusive.

Most notably, applicant argues that the species are indeed “patentably distinct” and not just “distinct” [page 8 of response filed October 26, 2007]. Since the species are admittedly “patentably distinct,” they can support different patents. Since applicant is entitled to “an invention” under 35 USC 101, and has not presented allowable generic claims, the restriction is proper and is made **FINAL**.

### ***Drawings***

2. The drawings received on August 24, 2004 are approved.

### ***Specification***

3. The disclosure is objected to because of the following informalities:

At [0007], line 8, “masks materials” should read –mask materials--.

At [0018], line 14, “hydrofluoric acid (HF)” should read –hydrogen fluoride (HF)--, for consistency with paragraphs [0019], [0021] and claim 3.

At [0022], line 16, “will occurs” should read –will occur--.

Withdrawn claim 8 includes “a said grain” at line 5.

Withdrawn claim 12 lacks antecedent basis for “said metal.”

Appropriate correction is required.

In claim 24, line 2, "material includes materials" should read --material includes material--, unless claim 24 is intended to require at least two materials, which would exclude the first embodiment which only requires 1 material (e.g. TERA) for the mask structure. Appropriate correction or explanation is required.

### ***Claim Objections***

4. Claims 1-7, 15-17 and 24 are objected to because of the misleading use of "interface". The use of "interface" in the claims implies and suggests an "interface" between "the material layer" and "the material surface".

However, the "chemical interface" of the first embodiment is not an interface of "the material layer" and "the material surface", but rather an interface between converted TERA "where water is evolved" and an etchant such as HF mixed with ethylene glycol [0023].

Furthermore, the "grain interface" of the "second embodiment" is an interface between two granular layers of polysilicon [0029], not an interface between "the material layer" and "the material surface" as claims 1 and 15 imply.

Finally, the "material interface" of the third embodiment is an interface between two differing materials of the material layer [0032], yet not an interface between "the material layer" and "the material surface" as claims 1 and 15 imply.

For purposes of examination, the claimed "interface" is considered to be anywhere within the material layer or at the material layer boundary, such as between the material layer and the material surface.

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Smith (US 4,049,349):

Regarding claim 1, the '349 reference discloses "a method of protecting a material surface" [col. 1, lines 27-31] comprising steps of "depositing a material layer on said material surface" [e.g. depositing a photoresist material layer on the surface of a semiconductor wafer], said "material layer providing an interface selected from the group consisting of a chemical reaction interface, a grain interface and a material interface" [i.e. the material layer is a photoresist and this material layer provides an interface that is a material interface wherein the material interface is an interface of the photoresist material and the material surface which is protected by the photoresist], lithographically patterning said material layer [col. 1, lines 15-22], and removing said material layer from said material surface selectively to said material surface [col. 1, lines 24-31].

Regarding claim 15, the '349 reference discloses a mask structure for semiconductor device manufacture [col. 1, lines 5-31, wherein the patterned photoresist serves as a mask structure for semiconductor device manufacture], the mask comprising a layer of material [i.e. a layer of patterned photoresist material], the layer providing an interface selected from the group consisting of a chemical reaction interface, a grain interface and a material interface [i.e. a material interface being an interface of two materials: the photoresist material and the semiconductor wafer surface material], wherein said interface provides at least one of increased resistance to semiconductor manufacturing processes and enhanced selectivity of an etching process for removal of said layer of material [i.e. the photoresist interface with the substrate provides at least increased resistance to semiconductor manufacturing processes because the photoresist "serves a purpose" of "selectively protecting" and staying in place in a semiconductor process such as "liquid or gaseous" etching per col. 1, lines 24-31].

7. Claims 15 and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen (US 6,815,367):



Regarding claim 15, the '367 reference discloses a mask structure [i.e. a "TERA hardmask"] for semiconductor device manufacture, the mask comprising a layer of material (13-14-12-11-10), the layer providing an interface selected from the group consisting of a chemical reaction interface, a grain interface and a material interface (e.g. there are material interfaces between each of 13-14-12-11-10), wherein said interface provides at least "increased resistance to semiconductor manufacturing processes" (e.g. the stack provides increased resistance to semiconductor manufacturing like etching of trenches because footing is eliminated and the stack stays in place during etching); furthermore, enhanced selectivity is provided by the mask because the mask can be removed to make a clean stack that has no footing).

Regarding claim 24, the '367, the layer of material includes tunable etch-resistant anti-reflective coating [col. 3, lines 36-40].

***Allowable Subject Matter***

8. Claims 2-7 and 16-19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter:



The prior art does not disclose the claimed method characterized by the limitation of "converting a material layer" (e.g. a mask material protecting a material surface of a wafer) using "a plasma containing hydrogen and oxygen or water vapor," which results in the claimed mask being characterized by the limitation of "OH groups or water incorporated" in the "layer of material" [e.g. the layer of material being an ARC layer].

The claimed mask structure [e.g. an ARC layer of carbon, silicon, and hydrogen] deposited by the claimed method [e.g. "using a plasma containing hydrogen and oxygen or water vapor to convert" the ARC "material layer"] is advantageously selectively etched with hydrogen fluoride (i.e. not hydrofluoric acid per [0019]) mixed with ethylene glycol [e.g. claim 6] or sulfuric acid [e.g. claim 7], such that the mask is highly selectively etched without etching underlying semiconductor structure.

### ***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Claussen et al. (US 6,245,640) discloses etching an ARC layer using HF mixed with ethylene glycol or sulfuric acid, like pending claims 6 and 7, yet the ARC layer of the '640 reference does not include OH groups such as by plasma treatment to convert the ARC layer as part of a deposition of the ARC layer, as is claimed in the instant case.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan Pert whose telephone number is 571-272-1969. The examiner can normally be reached on M-F (7:30AM-3:30 PM).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ETP  
January 15, 2008

  
**EVAN PERT**  
**PRIMARY EXAMINER**